

Local Wireless Services

Field of the Invention

The present invention relates to local wireless services and more particularly to the use of mobile terminals in the provision of local wireless services.

Background to the Invention

With the increasing use of mobile telephones, proposals have been made to make use of mobile telephones to control and interact wirelessly with local systems. For example, JP 8249530 describes the use of a mobile telephone to purchase goods from a vending machine by sending a radio signal directly to the vending machine or alternatively by placing a call to the vending machine over a telephone circuit. The cost of a purchased article or service is charged to the telephone subscriber's telephone account. Similarly, the use of mobile telephones to purchase such things as train and airline tickets, as well as to remotely operate televisions, stereos, etc, can be envisaged.

Consumer take-up of products offering this type of functionality will depend to a large extent upon the inter-operability of the products. The same applies to take-up by manufacturers. As such, the definition of some appropriate industry-wide standard for the radio interface between mobile terminals and local systems, e.g. vending machines, televisions, etc, is almost essential. A number of major electronics companies are currently working together in a project named "Blue Tooth" with the aim of providing such a standard.

Whilst the provision of a standard in this area will theoretically facilitate the interworking of mobile terminals with multiple local systems, a number of practical problems remain to be overcome.

Summary of the Present Invention

One such problem has been recognised by the inventor of the present invention. In relatively congested areas such as shopping centres, airports, railway stations etc, it is likely that several local systems offering a variety of products and services will be in close proximity to one another. A consequence of this is that the radio coverage provided by the systems will overlap. Whilst this does not necessarily represent a technical problem (the use of appropriate signalling technology will avoid cross-system interference), it may present a problem to the user of a mobile terminal who is likely to receive simultaneously several different and possibly competing messages and/or advertisements. A particular problem is that if the user wishes to take advantage of one particular service, he may not be certain with which service he is interacting.

It is an object of the present invention to overcome or at least mitigate the above noted disadvantages. This and other objects are achieved at least in part by facilitating interactive communication between a mobile terminal and a local service, or at least a critical part of said communication therebetween, only when the mobile terminal is positioned within a relatively small localised region.

According to a first aspect of the present invention there is provided a method of interworking between a mobile terminal and a local service in which information is conveyed between the local service and the mobile terminal over a local wireless communication channel, the method comprising:

broadcasting from the local service, over the wireless communication channel, service notification messages; and

conducting a mobile terminal identification process between a mobile terminal and the local service over the wireless communication channel, said process only proceeding if the mobile terminal is present within a localised region which is a sub-region of the region over which said service notification messages are broadcast.

Embodiments of the present invention enable different local services in the same vicinity to have respective "identification" regions, which may be spots, sectors, or the like. These identification regions may be distinguished on the floor with different colours, text, etc.

It will be understood that the term "local system" is used here to define a system which is capable of communicating with mobile terminals located in relatively close proximity to the system, e.g. within a range of 100 metres, 10 metres, or the like. The local service is typically a service provider or product dispenser.

Preferably, the mobile terminal is a cellular radio telephone or smart phone which communicates with a cellular radio network using a communications protocol, e.g. GSM, distinct from the protocol used over said local communication channel.

Whilst the service notification messages may be broadcast from the local service via a traditional broadcast antenna (where the wireless communication channel is a radio channel), the identification phase may be carried out using a directional antenna or receiver provided at the local service.

According to a second aspect of the present invention there is provided apparatus for interworking between a mobile terminal and a local service in which information is conveyed between the local service and the mobile terminal over a local wireless communication channel, the apparatus comprising:

a local system having transmitting means for broadcasting from the local service, over the wireless communication channel, service notification messages; and

at least one mobile terminal arranged in use to conduct an identification process with the local service over the wireless communication channel, said process only proceeding if the mobile terminal is present within a localised region which is a sub-region of the region over which said service notification messages are broadcast.

Preferably, the wireless communication channel is a radio channel, and the local system comprises a directional radio transmitter or receiver whose transmission/reception area defines said localised region.

According to a third aspect of the present invention there is provided a local service for interworking with a mobile terminal wherein information is conveyed between the local service and the mobile terminal over a local wireless communication channel, the local service comprising:

transmitting means for broadcasting, over the wireless communication channel, service notification messages;

a directional transmitter or receiver for defining a localised transmission/reception region which is a sub-region of the region over which said service notification messages are broadcast; and

processing means for conducting an identification process with a mobile terminal over the wireless communication channel and using said directional transmitter or receiver, said process only proceeding if the mobile terminal is present within the localised region.

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 shows schematically a vending machine and a mobile terminal which are able to interact with one another in accordance with an embodiment of the invention;

Figure 2 illustrates the radiation patterns produced by a broadcasting antenna and a directional antenna of the vending machine of Figure 1; and

Figure 3 is a flow diagram illustrating the method of operation of the system of Figure 1.

Detailed Description of Certain Embodiments

There is illustrated in Figure 1 a vending machine 1 which is one example of a local system in which the present invention may be employed. Articles which may be purchased from the vending machine include the likes of soft drinks, chocolate bars, etc. The vending machine has a control unit 2 which comprises a central processing unit 3 as well as a memory device 4 which stores control instructions for the central processing unit 3 as well as other data. The control unit 2 is electrically connected to the mechanical selection and outlet mechanism of the vending machine

1 such that the control unit can cause specific items to be dispensed to a consumer via an outlet tray 5 of the vending machine 1.

4 The control unit 2 also comprises a radio frequency transceiver 6 which is coupled on the one side to the central processing unit 3 via appropriate interface circuitry (not shown in the Figure) and on the other side to a transmitting and receiving broadcast antenna 7. The transceiver 6, antenna 7, and central processing unit 3 are arranged to communicate with mobile terminals such as mobile
8 telephones via a standardised local radio air interface protocol RI1. The range over which such communications may be carried out is relatively small, e.g. of the order of 10 metres.

12 The control unit 2 further comprises a directional transmitting and receiving antenna 8 coupled to the transceiver 6. The directional antenna 8 may be for example a mechanical slot type antenna. The control unit 2 is arranged to switch between the broadcast antenna 7 and the directional antenna 8 depending upon the particular transmission requirements. Figure 2 illustrates a plan view of the transmission/reception radiation patterns which may be produced by the two antennae
16 7,8, where the broadcast antenna 7 produces a generally circular pattern 9 and the directional antenna 8 produces a pattern 10 covering a restricted sector (shown cross-hatched) of the broadcast pattern. It will be appreciated that the radiation pattern produced by the directional antenna 8 will in practice deviate from the sector illustrated, e.g. having a lobe shape, and will
20 encompass a 3-dimensional region of space.

Figure 1 illustrates a typical mobile telephone 11 which may be thought of as a "smart phone". The telephone 11 comprises a display 12 and a keyboard 13, as well as a central processing unit
24 (or digital signal processor) 14. An antenna 15 and transceiver 16 of the telephone 11 enable the telephone to communicate in the normal way with a cellular telephone network 14, e.g. using the GSM protocol RI2, having a number of Base Station Subsystems 15 and a Mobile Switching Centre 16. However, the central processing unit 14 is additionally able to communicate with the
28 control unit 2 of the vending machine 1 using the previously mentioned standardised local air interface. The same antenna 15 and transceiver 16 may be used for such local communications although another antenna and transceiver may be required. As the telephone 11 is able to communicate using two different protocols, it may be considered a "dual-mode" telephone.

32 In use, the control unit 2 is arranged to broadcast at regular intervals a Service Notification message over its 10 metres broadcast range using the broadcast antenna 7. Mobile terminals such as the telephone 11 are programmed to listen for such Terminal Alert messages and, upon receipt,
36 to alert the telephone user that the telephone is within the coverage range of a local system to which the user has access. The Service Notification message will typically contain additional information describing the service which the broadcasting system offers. This may be displayed as text or an icon on the display 12 of the telephone 11.

40 The Service Notification message contains additional data which, in the event that the user responds to an "Accept Service?" prompt, causes the following message to be displayed on the

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telephone's display 12: "Please move into the red circle and press *". Figure 2 illustrates an example "red" circle 17 (shown shaded in the Figure) which may be painted on the floor in front of the vending machine.

4 The central processing unit 3 of the vending machine's control unit 2 then switches the output and input of the transceiver 6 from the broadcast antenna 7 to the directional antenna 8. Assuming that the user of the mobile telephone 11 enters the red circle 17, he enters within the transmission/reception area 10 of the directional antenna 8. By pressing "*", the user causes the mobile terminal 11 to transmit an Identification message which is received by the directional antenna 8. The Identification message contains, for example, the user's telephone number which uniquely identifies the telephone 11. It is noted that, in the event that the user presses "*" whilst outside the sector 10, the transmitted Identification message is not received by the vending machine 1 and the process is eventually timed-out.

8 Upon receipt of the Identification message at the vending machine 1, the central processing unit 3 of the control unit 2 initiates a telephone call to the operator of the cellular network 14 to which the mobile telephone 11 subscribes, either via a fixed line connection or via the cellular network. The identity of the operator, or a telephone number of the operator, may be returned to the control unit 2 in the Identification message. This telephone call is used by the control unit 2 to verify the identity of the mobile telephone 11 and to establish a billing relationship.

16 When the identity of the telephone 11 has been authenticated by the vending machine 1, the vending machine 1 initiates a transaction phase with the mobile telephone 11. This will not be described in detail here but could include, for example, the selection at the mobile telephone 11 of an article to be purchased, from a list of possible articles transmitted to the telephone 11 from the vending machine 1. The transaction phase may be conducted using either the broadcast antenna 7 or the directional antenna 8, as the interworking relationship between the telephone 11 and the vending machine 1 is now established.

24 Upon receipt of a Purchase message, the central processing unit 3 of the control unit 2 instructs the vending machine to select and dispense the article identified in the Purchase message. The central processing unit 3 then redials the number of the network operator (if the previous authentication connection has been terminated) and transmits an instruction to the operator to debit the transaction cost from the telephone user's account and to credit it to an account held by the operator of the vending machine 1. It will be appreciated that other charging schemes may be used. For example, the cellular network operator may act as an electronic bank for the subscriber, holding a deposit of electronic money. Electronic money is transferred to the vending machine operator (or his bank) upon completion of the transaction.

36 Figure 3 is a flow diagram illustrating the interworking procedure described above.

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It will be appreciated by the person of skill in the art that other modifications may be made to the above described embodiment without departing from the scope of the present invention. For example, the local radio link (R11) which couples the telephone 11 to the vending machine 1 may be replaced with an infra-red or ultra-sonic link.

As an alternative to using a directional antenna 8, the location of a transmitting mobile telephone may be determined by using an array of antennae at the vending machine 1. By using at least three receiving antennae and by measuring the relative propagation delays for a signal (codeword) transmitted from the mobile telephone, it is possible to verify that the telephone is within a predefined region. As a further alternative, radio signal may be directed to (and/or from) a predefined region using a waveguide or pipe for the purpose of verifying the location of a mobile telephone.

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